

Version A: HOWER UNIT 3

$$A \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix} \quad B \begin{pmatrix} 4 \\ -4 \\ 12 \end{pmatrix} \quad C \begin{pmatrix} 3 \\ -2 \\ 9 \end{pmatrix}$$

$$\vec{AC} = c - a$$

$$\begin{pmatrix} 3 \\ -2 \\ 9 \end{pmatrix} - \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix} = \begin{pmatrix} 2 \\ -4 \\ 6 \end{pmatrix} = 2 \begin{pmatrix} 1 \\ -2 \\ 3 \end{pmatrix}$$

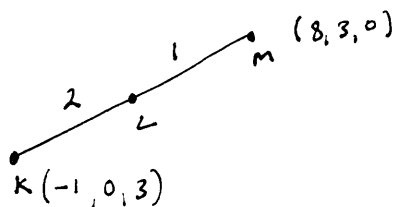
$$ii \quad \vec{AB} = b - a$$

$$\begin{pmatrix} 4 \\ -4 \\ 12 \end{pmatrix} - \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix} = \begin{pmatrix} 3 \\ -6 \\ 9 \end{pmatrix} = 3 \begin{pmatrix} 1 \\ -2 \\ 3 \end{pmatrix}$$

$$\text{Since } 2\vec{AC} = 3\vec{AB}$$

and A is a common Point
Then ABC are collinear

(16)



$$\begin{array}{cc} KL & LM \\ 2 & 1 \\ m & n \end{array}$$

$$L = \frac{mb + na}{m+n} \quad L = \frac{2b + a}{3}$$

$$\vec{KL} = L - K \quad \vec{LM} = M - L$$

$$L = 2 \begin{pmatrix} 8 \\ 3 \\ 0 \end{pmatrix} + \begin{pmatrix} -1 \\ 0 \\ 3 \end{pmatrix}$$

$$L = \frac{1}{3} \begin{pmatrix} 16 \\ 6 \\ 0 \end{pmatrix} + \begin{pmatrix} -1 \\ 0 \\ 3 \end{pmatrix}$$

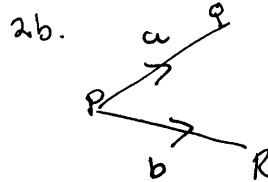
$$= \frac{1}{3} \begin{pmatrix} 15 \\ 6 \\ 3 \end{pmatrix} = \begin{pmatrix} 5 \\ 2 \\ 1 \end{pmatrix}$$

Co-ord (5, 2, 1)

$$2a \quad \vec{PQ} \quad \vec{PR}$$

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$$\begin{pmatrix} 2 \\ -1 \\ -2 \end{pmatrix} \times \begin{pmatrix} -3 \\ 0 \\ 4 \end{pmatrix} = \begin{pmatrix} -6 \\ 0 \\ -8 \end{pmatrix} = -14$$



$$\cos \theta = \frac{a \cdot b}{|a||b|}$$

$$\cos \theta = \frac{-14}{|a||b|}$$

$$|a| = \sqrt{2^2 + (-1)^2 + (-2)^2} = \sqrt{4+1+4} = \sqrt{9} = 3$$

$$|b| = \sqrt{(-3)^2 + 0^2 + 4^2} = \sqrt{9+16} = \sqrt{25} = 5$$

$$\cos \theta = \frac{-14}{3 \times 5} = \frac{-14}{15} = -0.93$$

$$\begin{array}{c|c} \sqrt{S} & A \\ \hline T & C \end{array}$$

$$\theta = 159$$

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Outcome 2

$$3a \quad \frac{dy}{dx} (-2 \sin x) = -2 \cos x$$

$$b \quad \frac{dy}{dx} \left(\frac{1}{3} \cos x \right) = -\frac{1}{3} \sin x$$

$$(4) \quad f(x) = (4x+3)^3$$

$$u = (4x+3) \quad y = u^3$$

$$\frac{du}{dx} = 4$$

$$\frac{dy}{du} = 3u^2$$

$$\frac{dy}{dx} = \frac{du}{dx} \times \frac{dy}{du}$$

$$\begin{aligned} \frac{dy}{dx} &= 3u^2 \times 4 \\ &= 3(4x+3)^2 \times 4 \\ &= 12(4x+3)^2 \end{aligned}$$

$$\textcircled{5} \int -2 \cos x \, dx$$

$$= -2 \sin x + C$$

$$b) \int \left(\frac{3}{4} \sin x\right) dx$$

$$= -\frac{3}{4} \cos x + C$$

$$c) \int_1^3 (x-1)^3 dx$$

$$\left[\frac{(x-1)^4}{4 \times 1} \right]_1^3 = \left[\frac{(x-1)^4}{4} \right]_1^3$$

$$\frac{(3-1)^4}{4} - \frac{(1-1)^4}{4}$$

$$\frac{2^4}{4} - 0$$

$$\frac{16}{4} = 4$$

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Outcome 3

$$6a \log_{10} 10 - \log_{10} a^2$$

$$= \log_{10} \frac{10}{2}$$

$$= \log_{10} 5$$

b. Simplify

$$4 \log_8 2 + \log_8 4$$

$$\log_8 2^4 + \log_8 4$$

$$\log_8 16 + \log_8 4$$

$$\log_8 (16 \times 4)$$

$$\log_8 64$$

$$\log_8 8^2$$

$$2 \log_8 8 = 2 \times 1 = 2$$

$$7a \text{ If } x = \frac{\log_e 5}{\log_e 2}$$

$$= \frac{0.699}{0.301} = \underline{2.32}$$

$$7b. \log_{10} y = 4.1$$

$$y = 10^{4.1}$$

$$7c \quad y = 10^{1.9}$$

$$= 79.4$$

Outcome 4

$$\textcircled{6} 3 \cos x + 5 \sin x$$

$$= k \cos(x-a)$$

$$= k \cos x \cos a + k \sin x \sin a$$

$$k \cos a = 3$$

$$k \sin a = 5$$

✓ S	✓ A
✓ T	✓ C

$$k = \sqrt{3^2 + 5^2}$$

$$k = \sqrt{34}$$

$$\tan a = \frac{\sin}{\cos} = \frac{5}{3}$$

$$a = 59^\circ$$

$$3 \cos x + 5 \sin x = \sqrt{34} \cos(x-59)$$